



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/761,381	01/22/2004	Shinji Murai	247955US2SRD	2421
22850	7590	08/31/2007		
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			EXAMINER TRINH, THANH TRUC	
			ART UNIT 1753	PAPER NUMBER
			NOTIFICATION DATE 08/31/2007	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com
oblonpat@oblon.com
jgardner@oblon.com

Office Action Summary

Application No.

10/761,381

Applicant(s)

MURAI ET AL.

Examiner

Thanh-Truc Trinh

Art Unit

1753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.138(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 June 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 and 9-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 and 9-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
1. Claims 1-4 and 6-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gaudiana et al. (PGPub 2003/0188777) in view of Kang et al. ("Enhanced Stability of Photocurrent-Voltage Curves in Ru(II)-Dye-Sensitized Nanocrystalline TiO₂ Electrodes with Carboxylic Acids", Journal of The Electrochemical Society, Vol. 147 (8), 2000, pages 3049-3053)

Regarding claims 1 and 13, as seen in Figure 6, Gaudiana et al. disclose a dye-sensitized solar cell 600 comprising a semiconductor electrode 603 containing dye (sensitizing dye) and carboxylic compound of co-sensitizer, the dye and carboxylic compound being carried on a surface of the semiconductor electrode (See Figures 6

and 13, paragraphs [0047-0051], [0016-0118]); a counter electrode (or conductor 618); and an electrolyte composition (or charge carrier 606) provided between the semiconductor electrode and the counter electrode, and containing an electrolyte that contains iodine and molten salt of iodide. (See paragraphs [0080]-[0081], [0086]).

Regarding claims 2-3, Gaudiana et al. describe the electrolyte composition further contains a gelling agent, which is poly(4-vinyl pyridine). (See paragraph [0081]).

Regarding claim 4, Gaudiana et al. describe the electrolyte contains inorganic salt of iodide such as lithium iodide. (See paragraph [0053] or [0086]).

Regarding claim 6, Gaudiana et al. describe the molten salt iodide includes iodide of nitrogen-containing heterocyclic compound, such as methylpropylimidazolium iodide, methylbutylimidazolium iodide ... (See paragraph [0080])

Regarding claim 7, Gaudiana et al. describe the molten salt iodide includes 1-methyl-3-propyl imidazolium iodide. (See Example 12 in paragraph [0096]).

Regarding claim 9, Gaudiana et al. describe the electrolyte further contains water. (See paragraph [0081])

Regarding claim 10, Gaudiana et al. describe the content of water in the electrolyte is either 0.5 wt% or 1.0 wt%, which is well within the instant claim range of 0.01 wt.% to 10 wt.%.

Regarding claim 11, Gaudiana et al. describe the semiconductor electrode contains titanium oxide particles. (See paragraph [0050])

Regarding claim 12, Gaudiana et al. describe the electrolyte composition is substantially in the form of a liquid or a gel. (See paragraph [0052])

Gaudiana et al. does not specifically teach carboxylic compound being at least one acid from the group consisting of acetic acid, propionic acid, 3-bromopropionic acid, benzoic acid and butyric acid.

Kang et al. teach the carboxylic compound can be acetic acid, benzoic acid, butyric acid. (See Table 1 and the whole document)

It would have been obvious to one having ordinary skill in the art to modify the dye-sensitized solar cell of Gaudiana by using the carboxylic acid compound as taught by Kang et al., because it would provide a dramatic improvement in the stability together with an increase in short-circuit photocurrent and decrease in the open-circuit photovoltage. (See Conclusion of Kang et al.)

2. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Guadiana et al. in view Kang et al. and further in view of Wariishi et al. (US Patent 6376765).

Regarding claim 5, Guadiana et al. and Kang et al. disclose a dye-sensitized solar cell as described in claim 1.

Neither Gaudiana et al. nor Kang et al. explicitly teach using electrolyte having viscosity-lowering agent containing at least one compound selected from the group consisting of salt of nitrogen-containing heterocyclic compound and salt of aliphatic compound.

Wariishi et al. teach using electrolyte containing salt of nitrogen-containing heterocyclic compound. (See Formula 4 and col. 8 lines 61-68 and col. 9 lines 1-16).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Gaudiana et al. and Kang et al. by using electrolyte containing salt of nitrogen-containing heterocyclic compound as taught by Wariishi et al., because it would provide excellent durability and photoelectric conversion properties. (See col. 1 lines 58-63).

Response to Arguments

Applicant's arguments filed 06/05/2007 have been fully considered but they are not persuasive.

Applicant argues that the carboxylic compound in claim 1 does not contain nitrogen, and the carboxylic compound suppresses backflow of the electrons from the semiconductor electrode to an electrolyte composition, thereby improving energy conversion efficiency. The Examiner replies that there is nothing in the claim language or in the specification indicating the carboxylic compound should not contain nitrogen. In addition, Gaudiana et al. also teach the co-sensitizers such as diphenylaminobenzoic acid, 2,6bis(4-benzonicacid)-4-(4-N,N-diphenylamino)phenylpyridine carboxylic acid, N',N-diphenylaminophenylpropionic acid (paragraph [0006]) are in fact carboxylic compounds, especially N',N diphenylaminophenylpropionic acid is a propionic acid with a substituent of N',N-diphenylaminophenyl. Gaudiana et al. also teach the co-sensitizers have been demonstrated to increase the efficiency of photovoltaic cells by as much as 17% by improving their charge transfer efficiency and reducing the back transfer of electron from the interconnected semiconductor oxide nanoparticle material. (See

paragraph [0005]). Therefore, carboxylic compounds without nitrogen have no patentable significance compare to carboxylic compounds with nitrogen, unless a new and unexpected result is produced.

Applicant also argues that the co-sensitizers containing nitrogen taught by Gaudiana et al. are different from acetic acid, propionic acid, 3-bromopropionic acid, benzoic acid and butyric acid, which do not include a nitrogen atom. As previously disclosed in claim 8 which is now cancelled, Applicant only claimed acetic acid, propionic acid and butyric acid without any indication of their formulas, therefore the Examiner interpreted the acids as they were in their general form, either with or without substituents. The Applicant has amended the claim 1 to include 3-bromopropionic acid and benzoic acid. Therefore, new ground of rejection is made. (See rejection above)

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

Art Unit: 1753

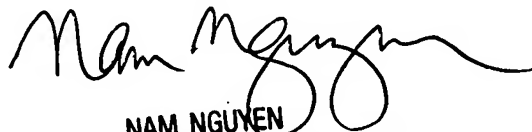
extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh-Truc Trinh whose telephone number is 571-272-6594. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TT
08/06/2007


NAM NGUYEN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700